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DESCRIPTION OF A FOSSIL HUMERUS (MARSUPIALIA) FROM THE LOWER PLIOCENE OF VICTORIA, AUSTRALIA

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Abstract

A description is given of a fossil humerus from the Lower Pliocene of E. Victoria that most probably represents a Tertiary marsupial as yet undiscovered. The bone possesses some features in common with the extant American opossum *Didelphis*. These are interpreted as indicating a generalized or primitive condition rather than a direct relationship with the Didelphoidea.

Introduction

The fossil bone described in this paper was collected from the Upper Shell Bed of the Jemmy's Point Formation where it is exposed on the SW. side of Bunga Ck Rd Cutting on the Princes Highway, Victoria. It was collected by Mr Edmund Gill and I am indebted to him for allowing me to describe it. The Jemmy's Point Formation is a series of marine, calcareous sands with a considerable degree of lithological variety (Wilkins 1963). Wilkins considers the Upper Shell Bed to be of Lower Pliocene age and to represent the top of the Kalimnan Stage. Besides shelly calcareous silty sands, the Upper Shell Bed also contains rounded pebbles and particles of carbonaceous material. This suggests that terrestrial material was occasionally deposited in the Upper Shell Bed, so the occurrence in this marine bed of a portion of a terrestrial animal should cause no undue surprise. In fact, from Wilkins's descriptions of carbonaceous fragments in a number of the lithological units and probable lagoonal beds, it would seem as though most of the Jemmy's Point Formation were deposited in close proximity to land.

There is substantial reason to believe that this fossil humerus represents a Lower Pliocene animal, and that it is not a portion of a recently disarticulated skeleton that has subsequently come to lie in an exposure of the Upper Shell Bed. There are three reasons for considering that the bone was found at a site of primary deposition: (1) the specimen was discovered in situ and covered by matrix, (2) the bone exhibits heavy mineral staining and pyrites crystals on one surface, indicating considerable time since deposition, and (3) this humerus cannot be assigned to any living species of Australian mammal.

Description

The specimen is a left humerus with both proximal and distal epiphyses missing. The loss of the epiphyses has resulted in some weathering at each end of the diaphysis. However, in general, the remaining bone is in a good state of preservation and the surface bone shows no sign of deep weathering. The shank, or diaphysis, is 60·3 mm long. The shaft is 6·8 mm in diameter at the distal termination of the deltoid crest.

The deltoid crest is low and extends half way down the shaft. The bicipital groove is shallow and exhibits at its distal end the clearly delineated muscle scars of the latissimus dorsi and teres major. The distal portion of the diaphysis is expanded at right angles to the plane of the deltoid crest. There is an entepicondylar foramen. The supinator crest is well developed, although it should be noted that some living Australian marsupials possess a relatively larger crest. This point will be discussed later. The distal portion of the supinator crest and also the ectepicondylar process have been broken off. The distal expanse of bone between the entepicondylar foramen and the supinator crest is convex and devoid of muscle scars and depressions on its anterior surface. On the posterior surface, close to the broken margin, there is a slight indication of the olecranon fossa.

Discussion

It is difficult to determine the proper affinities of isolated postcranial elements. Comparative skeletal material of recent animals is usually not available since it has frequently been the habit of collectors to preserve only the skull and skin of select specimens. Because of the paucity of postcranial material in collections, it is not possible to discuss the range of variation in the morphology of the humeri of Australian marsupials. With the material available to me, I have found it possible to make only rather general comparisons and the remarks to follow should be considered somewhat tentative.

First, there is little in the anatomy of this humerus to mark it as belonging specifically to a marsupial; it could almost as well belong to a placental. However, there are two reasons for considering that it most probably represents a marsupial: (1) the unlikelihood of a terrestrial placental being preserved in late Tertiary deposits in Victoria, and (2) the loss of the epiphyses suggests that they were loosely attached to the diaphysis, a feature that is characteristic of marsupials at all stages of growth.

There are no other fossil humeri described from Australia with which this fossil can be compared. The partially complete skeleton of the Oligocene diprotodont *Wynyardia bassiana* unfortunately lacks the pectoral girdle and forelimbs (Spencer 1900, Wood-Jones 1930). Also, *Wynyardia*, although approximately equal in size to the living *Trichosurus* spp., possessed bones of a considerably more robust nature than *Trichosurus*. The fossil under consideration here is not more robust than its counterpart in *Trichosurus* and, thus, would probably be too slight to belong to *Wynyardia*. But, as a word of caution, it should be remarked that we do not know what the range of variation in a population of *Wynyardia* might have been, and it may very well have been great enough to include this slightly smaller form.

The humeri of some of the medium sized living marsupials bear no resemblance to this fossil and need not concern us. In this category fall the relatively long, slender humeri of thylacines and bandicoots, the stocky, rather larger humerus of the cuscus, and the powerful humeri modified for digging in the wombats. Nor does this fossil resemble the humerus of any macropod that I have been able to examine. Macropods have a characteristic protuberance on the external side of the shaft to accommodate part of the origins of two well developed brachial muscles, the brachialis anterior and triceps externus (Fig. 1E). This eminence, which may occasionally protrude several millimetres above the contour of the bone, is completely lacking from this fossil and, as far as I can determine, from all non-macropod marsupials.

This strengthening of the site of origin of these two antagonistic forelimb muscles in macropods may somehow be associated with the different use of the forelimbs in that group. At any rate, I should consider the lack of a protruding

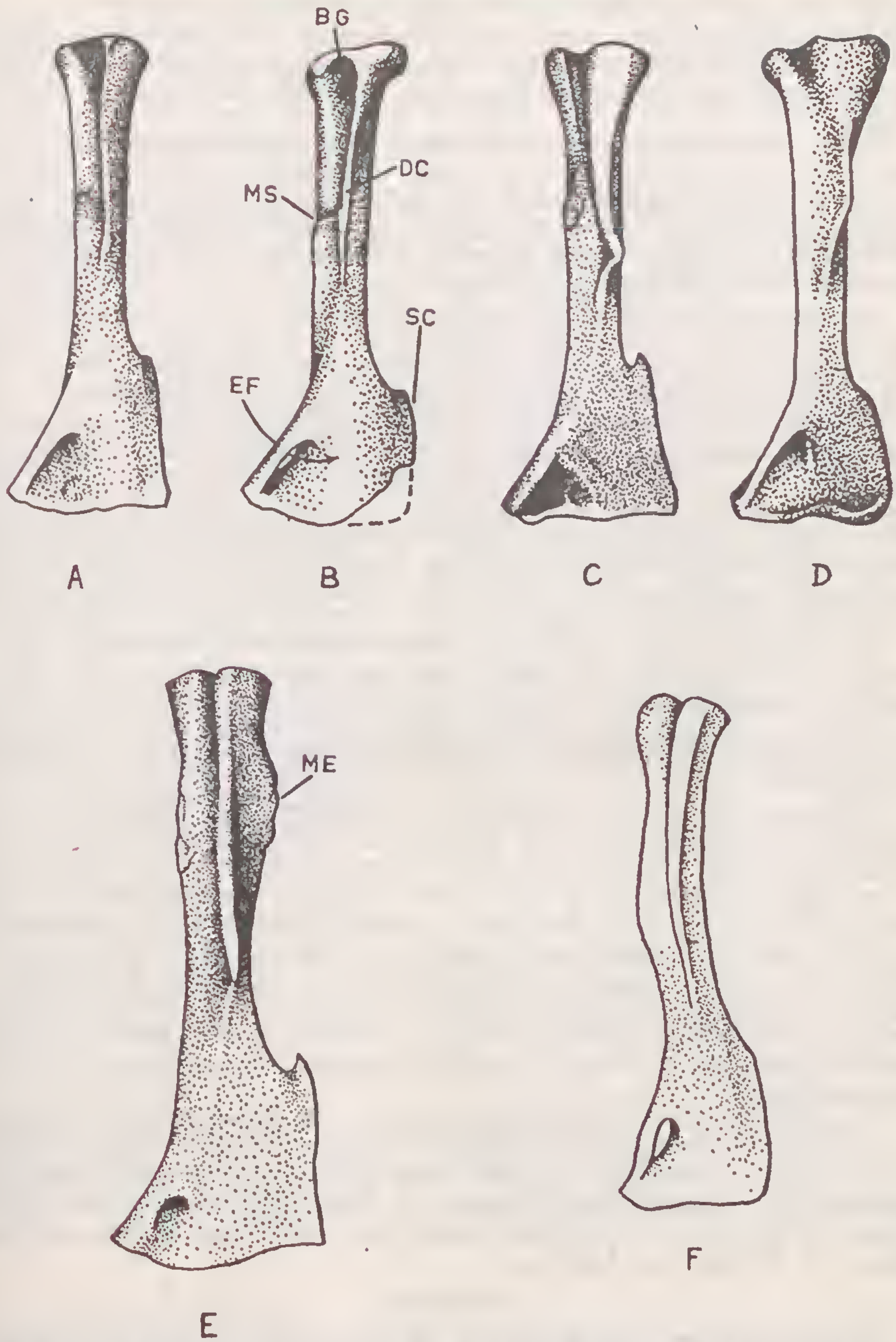

FIG. 1—Anterior aspect of left humeri, shown without epiphyses, natural size. A. *Didelphis marsupialis*. B. Bunga Ck fossil (Nat. Mus. Vict. No. P22650). C. *Trichosurus caninus*. D. *Sarcophilus harrisi*. E. *Wallabia bicolor*. F. *Notharctus* sp., redrawn from Gregory (1949, Fig. 27). BG, bicipital groove; DC, deltoid crest; EF, entepicondylar foramen; ME, muscle scar of brachialis anterior and triceps externus; MS, muscle scar of latissimus dorsi and teres major; SC, supinator crest.

brachialis-triceps crest sufficient to exclude the fossil humerus from being allied with macropods, at least as we know them today. This conclusion has some significance since the only other Lower Pliocene mammal described from Victoria is a macropod from the Grange Burn area near Hamilton (Colliver 1933, Gill 1957).

In Fig. 1 the fossil humerus is illustrated along with the humeri of the three groups of marsupials which it most closely resembles in both size and general features; a juvenile Tasmanian Devil (*Sarcophilus harrisi* 1D), a mountain possum (*Trichosurus caninus* 1C), and an American opossum (*Didelphis marsupialis* 1A). A brief word of comparison is in order although most of the similarities and differences can be gleaned from the figure.

In *Sarcophilus* the shaft of the humerus is more robust and the bicipital groove is barely expressed. The deltoid crest is narrow, does not extend to the proximal margin, and is steeply slanted away from the midline. The arcade of the entepicondylar foramen is narrow and the supinator crest is weakly developed.

The humeri of *Trichosurus caninus* and *T. vulpecula* are virtually identical and they differ in some major features from the fossil humerus. In *Trichosurus* the deltoid crest is a massive ridge that is gently curved and ends as a slightly raised protuberance about halfway down the shaft. The bicipital groove is represented by a deep furrow. The entepicondylar foramen is well developed and opens medially into a fossa which is completely absent in the fossil. The supinator crest is large and extends two-thirds of the way up the external border of the shaft to end as a characteristic hook-shaped eminence.

The humerus of the American opossum most clearly resembles the fossil specimen. In the opossum the deltoid crest is low and relatively straight. It extends from the proximal margin to midway down the shaft. The entepicondylar foramen is roofed by a heavy arcade and opens medially into a shallow fossa. The supinator crest is moderately developed and extends slightly less than two-thirds of the way up the shaft.

The general form of the humerus in marsupials is frequently taken as an 'archetype' from which the humeri of placentals could have been evolved. In fact, the humerus in the Paleocene lemuroid *Notharctus* is not greatly different from that of many marsupials (Fig. 1F). In this primitive placental there is a slight medial bowing of the shaft resulting in a smooth eminence for the attachment of the teres major. The deltoid crest is narrow and diverges laterally away from the midline. The proximal region of the supinator crest, unlike that of the Bunga Ck specimen, merges smoothly into the shaft. An entepicondylar foramen is present in *Notharctus* and, for that matter, also in a number of more advanced primates. However, this foramen, which is a common feature in marsupials, is lacking in most placentals.

Gregory (1949) has compared the humeri of all major groups of tetrapods in an endeavour to determine the phylogenetic changes of this skeletal element. In his opinion it is possible to derive the generalized humeri of both placentals and marsupials from scantily known humeri of Mesozoic mammals. The reader is referred to his profusely illustrated paper for a discussion of the comparative anatomy of the vertebrate humerus.

Summary

The fossil humerus from Bunga Ck, like the humerus of *Didelphis*, appears to be primitive and unspecialized even for a marsupial. However, in comparing this fossil to the humerus of *Didelphis*, and commenting on the similarities shared by

the two, I do not wish to infer that the fossil is necessarily a didelphoid. A humerus of this nature was probably possessed by any number of early, more generalized marsupials. As an example of primitive didelphoid characters being retained in a non-didelphoid marsupial, Ride (1964) has pointed to some striking similarities in the skull and pelvic girdle features of *Wynyardia* and *Didelphis*, although the two are certainly dissimilar in other important characters (dentition, vertebral structure, and construction of the hindlimb).

It is best to consider the Bunga Ck specimen as belonging to an animal as yet undiscovered. Its real significance lies in that it was found in a marine bed that can be dated and, thus, will prove useful in future efforts to describe and properly correlate the history of Tertiary marsupials from various localities in Victoria.

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Explanation of Plate

PLATE 20

Fossil humerus from the Lower Pliocene Jemmy's Point Formation of E. Victoria, × 1. Upper left, anterior view; upper right, medial view; lower left, posterior view; lower right, lateral view. Nat. Mus. Vict. No. P22650.